

Application No. 09/811,389  
Amendment under 37 CFR 1.111  
Reply to Office Action dated April 23, 2003  
October 23, 2003

REMARKS

By this amendment, claims 1-10 have been cancelled, claims 11, 15-17, 19, 21 and 23-25 have been amended and new claim 26 has been added to the application. Currently, claims 11-21 and 23-26 are pending in the application.

Examiner Pham is thanked for the courtesies extended to the undersigned during the personal interview on August 27, 2003. During the interview, claims 11, 13, 21 and 23-25 and the references to Matsuyama (U.S. Patent No. 6,292,279) and Takahashi et al. (U.S. Patent No. 5,883,385) were discussed. Examiner Pham stated in the Interview Summary that inclusion in the base claims of the following limitations would overcome the prior art of record, namely: the photographic paper being directly exposed by the laser beams, the laser beams being adjusted to be coincided on the surface of the photographic paper, a conveyor for linearly conveying the photographic paper at a constant speed toward the scanning area, and the developer for developing the latent image on the photographic paper. Examiner Pham also indicated that a further search would be needed once the claims are amended as indicated above. Applicant submits that the claims have been amended in accordance with the discussion at the interview.

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Claims 5-7, 9, 15-17 and 19 were objected to because the term "the adjuster" should read -- each of the adjusters --. Since claims 5-7 and 9 have been cancelled, these objections are now moot. Similarly, claims 15-17 and 19 were objected to because the term "the adjuster" should read --each of the adjusters--. The term "the adjuster" has been amended to --each of the adjusters-- in these claims. It is respectfully submitted that this objection should be withdrawn in view of these amendments.

Claims 1-3, 7-13, 17-22 and 25 were rejected under 35 USC 103(a) as being unpatentable over Matsuyama (U.S. Patent No. 6,292,279) in view of Takahashi et al. (U.S. No. 5,883,385).

The Examiner believed that Matsuyama disclosed an optical recording device comprising three laser light sources emitting red, green and blue light beams, respectively, an optical path adjusting system including a position sensor (35) and a corresponding adjuster (mirrors 4-6) for adjusting an optical path of the red, green, blue laser beams. The Examiner believed that Matsuyama disclosed that the position sensor was carefully disposed at a plane that optically conjugates the focal point (10) of the three laser beams. The Examiner also believed that Matsuyama disclosed a beam splitter, a total reflection mirror

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used as the optical path adjuster, the mirror being rotated around an axis by an actuator (36X, 36Y), and a processor (not shown). The Examiner also stated that all of the laser beams are adjusted to overlap at a certain point (10).

The Examiner also stated that Matsuyama failed to teach the position sensor being disposed at a plane that optically conjugates with the plane corresponding to the photographic paper. The Examiner also stated that Matsuyama did not disclose the optical scanning system.

The Examiner believed that Takahashi et al. disclose a multi-beam scanning apparatus including a respective optical path adjusting device (galvanomirrors 3a, 3b) for adjusting the optical path of each of the laser beams (La, Lb) based on the detection of the laser beams by the position sensor (13), which can be disposed in various locations within the apparatus but remains optically conjugated with the surface of the photosensitive drum. The Examiner also believed that it would have been obvious at the time the invention was made to modify the device of Matsuyama with the aforementioned teaching of Takahashi et al. for the purpose of sensing the position of the laser beams as they scanned the surface of the photographic paper.

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This rejection is respectfully traversed in view of the amendments to the claims and the following remarks.

The present invention relates to a photographic printer using the laser beam scanner as an exposure apparatus for exposing a photographic paper.

Fig. 1 shows the photographic printer according to an embodiment of the invention. The photographic printer comprises an exposure unit 20 for exposing a photographic paper, a developing unit 30 for developing, fixing, bleaching and stabilizing the photographic paper and a drying unit 40 for drying the photographic paper. A first belt conveyor 42 and a second belt conveyor 43 are provided on the top of the developing unit 30. Developed photographic paper sheets carried out from an outlet 41 are piled on the first belt conveyor 42 by the same job. Each bunch of the photographic paper sheets are aligned on the second belt conveyer 43.

The exposure unit 20 is a dark box including a laser beam scanner 100, a magazine 21 containing a roll of photographic paper, a cutter for cutting the photographic paper into a predetermined size of a photographic paper sheet, an additional conveyor for pulling out the photographic paper from the magazine 21 and transferring it to the cutter and for conveying the

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photographic paper sheet to the developing unit 30 through an exposing portion.

The optical paths 105 in the laser beam scanner 100 and monitoring system for monitoring the position of the reflected laser beams by the adjustable mirrors 110 is shown in Fig. 4. A position sensor 201 such as a two-dimensional position sensitive detector (PSD) is disposed at a position or on a plane P2 conjugating with a standard position on the scanning line or a scanning plane P1 on a surface of a photographic paper sheet 1 conveyed by the conveyor. The photographic paper is conveyed in a predetermined direction (the direction is called "sub-scanning direction") at a predetermined constant speed.

In the photographic printer, it is important that the scanning lines of the laser beams overlap on the photographic paper sheet 1. Thus, the adjustment of the optical paths of the laser beams is executed so that the red laser beam and the blue laser beam are to be overlapped on the green laser beam.

As can be seen from Fig. 5, the positions designated by symbols R and G coincide, so that the red laser beam can be overlapped on the scanning line or position of the green laser beam. The position designated by symbol B is discrepant from the positions designated by symbols R and G, so that the blue laser

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beam cannot be overlapped on the scanning line or position of the green laser beam. When the discrepancy of the positions is not acceptable, this causes the occurrence of bleeding in color development when the exposed photographic paper 1 is developed. Thus, the adjustable mirror 110 and the laser light source 104B corresponding to the blue laser beam are adjusted in a manner so that the position of blue laser beam designated by symbol B moves to approach the positions of the red and green laser beams designated by symbols R and G along arrow F in Fig. 5.

Claims 11, 21 and 25 have been amended to recite "a photographic printer comprising: a laser beam scanner including: a first laser light source for oscillating and emitting a red laser beam; a second laser light source for oscillating and emitting a green laser beam; a third laser light source for oscillating and emitting a blue laser beam". Claims 11, 21 and 25 also have been amended to recite "a conveyor for linearly conveying a photographic paper to a predetermined scanning plane of the laser beam scanner at a predetermined constant speed". Claims 11, 21 and 25 also have been amended to recite "a developer for developing a latent image exposed on the photographic paper by the laser beam scanner". Claim 25 has also been amended to recite "a conveyor for linearly conveying a

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photographic paper to a predetermined scanning plane of the laser beam scanner at a predetermined constant speed".

Matsuyama relates to an optical system for recoding or replicating holograms. More specifically, Matsuyama relates to a hologram recording or replicating optical system capable of preventing misalignment of the center of a laser generated beam with the passage of time, which may otherwise disturb a color balance in a color hologram surface and a multicolor hologram recording or replicating optical system which can prevent a variation of the color balance in a multicolor hologram surface, which is caused by a laser beam diameter difference for each color.

Matsuyama discloses a beam detecting system 54 including three beam position detectors 35 (shown in Fig. 1b) for detecting the positions of the laser beams in Fig. 2. The position control signals are entered to a personal computer 55 and calculations regarding the deviations of the laser beam positions are performed and position control signals to correct the deviations are output from the computer. According to the deviation correction signals output from the personal computer, the control over each of adjusting mirrors is performed (see column 7, lines 8-44). Furthermore, three laser beams from a G laser source 2,

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an R laser source 1 and a B laser source 3 are aligned at a point around a pinhole 10 immediately downstream of a lens 9 (see Fig. 3). The pinhole 10 is disposed between the lens 9 and the photosensitive material 20.

The Examiner has admitted that Matsuyama does not teach the position sensor being disposed at a plane optically conjugates with the plane corresponding to the photographic paper. The Examiner also admitted that Matsuyama does not disclose the optical scanning system.

Matsuyama also does not disclose a conveyor for linearly conveying a photographic paper to a predetermined scanning plane of the laser beam scanner at a predetermined constant speed.

Applicant also believes that Matsuyama does not disclose the adjustment of the positions of the RGB laser beams on a photographic paper that is transferred by a conveyor used in a photographic printer.

Matsuyama also does not disclose a developer for developing a latent image exposed on the photographic paper by the laser beam scanner.

Takahashi et al. do not make up for the deficiencies in Matsuyama. Takahashi et al. relate to a multi-beam scanning apparatus. Takahashi et al. disclose two laser sources 1a and 1b

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in Fig. 1. Takahashi et al. also disclose the surface of a photosensitive drum is scanned with a plurality of laser beams at once, and these laser beams are modulated by different items of image information thereby to record an image. Since a plurality of lines of the image are formed simultaneously using a plurality of laser beams, the recording speed can be increased by the number of laser beams without changing the speed of the rotating polygon mirror or the image information transfer rate.

Takahashi et al. also disclose that a main object is to provide a multi-beam scanning apparatus which is capable of using a plurality of separate laser beam generation sources and the positions of the beams and the pitch between beams can always be set on target with high precision and the quality of images can be maintained for a long time even when it is applied to a printer or a copying machine. Thus, applicant respectfully submits that it can be assumed that the laser beams generated from the sources 1a and 1b are basically the same in nature (i.e. the same wavelength) but the pitch therebetween can be adjusted and controlled (see col. 6, lines 9+).

Takahashi et al. also disclose that a reflection mirror 12 is provided within a scanning range of the laser beams La and Lb and on the scanning start side not included in an image forming

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region of the drum 10. The laser beams La and Lb are guided to a sensor 13 through the reflection mirror 12 to sense the positions of these laser beams in the main scanning direction and sub-scanning directions. The sensor 13 is located optically in conjugation with the surface of the photosensitive drum 10 (see column 6, lines 25-32).

Takahashi et al. do not disclose that a conveyor for linearly conveying a photographic paper to a predetermined scanning plane of the laser beam scanner at a predetermined constant speed.

Applicant respectfully submits that Takahashi et al. do not disclose the adjustment of the positions of the RGB laser beams on a photographic paper which is transferred by a conveyor used in a photographic printer.

Takahashi et al. also do not disclose that a developer for developing a latent image exposed on the photographic paper by the laser beam scanner.

Applicant also submits that both Matsuyama and Takahashi et al. do not disclose positional adjustment of the positions of the RGB laser beams on a photographic paper. Applicant also believes that both Matsuyama and Takahashi et al. do not disclose that a sensor is positioned on a plane which is optically conjugated

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with a photosensitive surface of the photographic paper over which the positions of lasers are being adjusted.

It is therefore respectfully submitted that both Matsuyama and Takahashi et al., individually or in combination, do not disclose or suggest the presently claimed invention and it would not have been obvious to one of ordinary skill in the art to combine these references to render the present claims obvious. Accordingly, independent claims 11, 21 and 25 clearly define over the prior art of record and should be allowed.

Claims 4, 14 and 23-24 were rejected under 35 USC 103(a) as being unpatentable over Matsuyama in view of Takahashi et al., as applied to claims 1 and 11 above, and further in view of Uemura et al. (U.S. Patent No. 5,436,645). Further, dependent claims 5-6 and 15-16 were rejected under 35 USC 103(a) as being unpatentable over Matsuyama in view of Takahashi et al., as applied to claims 1 and 11 above, and further in view of Winsor (U.S. Patent No. 4,560,244). Applicant submits that that the present claims are allowable in view of the amendments that have been made to the claims as discussed above.

Further, independent claims 23 and 24 (which are similar to claims 11, 21 and 25) have been amended to recite "A photographic printer comprising: a laser beam scanner"; "a conveyor for

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linearly conveying a photographic paper to a predetermined scanning plane of the laser beam scanner at a predetermined constant speed"; and "a developer for developing a latent image exposed on the photographic paper by the laser beam scanner". These claims also contain other features discussed above in connection with claims 11, 21 and 25. Therefore, applicant respectfully submits that these claims are also allowable in view of these amendments.

New claim 26 has been added to this application. New claim 26 is similar to original claim 11 and includes additional features including an exposure unit that includes a magazine and a laser beam scanner, the magazine contains a roll of photographic paper, and a cutter for cutting the photographic paper into a predetermined size of a photographic paper sheet. Also, the new claim 26 includes a dryer for drying the photographic paper. These features of the claim are supported by page 6, lines 1-10 of the specification.

Applicant respectfully submits that claim 26 also defines over the prior art of record and allowance of this claim is respectfully requested.

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In summary, applicant respectfully submits that the application is now in condition for allowance and an action to this effect is respectfully requested.

If there are any questions or concerns regarding the amendments or these remarks, the Examiner is requested to telephone the undersigned at the telephone number listed below.

Respectfully submitted,

  
Randolph A. Smith  
Reg. No. 32,548

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SMITH PATENT OFFICE  
1901 Pennsylvania Ave., N.W.  
Suite 200  
Washington, DC 20006-3433  
Telephone: 202/530-5900  
Facsimile: 202/530-5902  
Mano102303